REMARKS

Claims 1-18, as amended, are pending for the Examiner's consideration. Claims 4 and 10 have been amended as noted below. Independent claim 4 has been amended to include the word "circuit" following "a closed loop feedback" to more distinctly claim the invention. Such an amendment is supported, for example, on page 7, line 32 of the application. As these amendments do not introduce new matter, the applicant respectfully requests favorable reconsideration and allowance of the application in view of the above amendments and the following remarks.

The sections set forth below are presented in the same order as that of the Action for ease of reference.

Informality Objection

Claim 11 was objected to for reciting an "electric motor," which was allegedly unclear in view of claim 10 upon which it depends. Dependent claim 10 has been amended to recite "a component" and to make it more clear that this includes the electric motor linear speed "controller" of claim 1. These cosmetic changes clarify claim 10 so that claim 11 now clearly further defines the component as an electric motor. No modification to the claim scope is intended, either to enlarge or to narrow the claim. The applicant respectfully submits that this rejection has been obviated and should be withdrawn.

Claim Rejections under 35 U.S.C. § 102(b)

Claims 4-7, 9 and 15-17 were rejected for allegedly being anticipated under 35 U.S.C. § 102(b) by Archer et al., U.S. Patent No. 5,592,058 ("Archer").

The applicant first presents a brief discussion of the control system disclosed by the cited Archer reference. Archer generally relates to electronically controlled motors for use in heating, ventilating and/or air conditioning systems having motors operating according to predetermined parameters that are selected to correspond to the system in which the motor is installed (see col. 1, lines 6-11 of Archer). Fig. 1 illustrates a system 100 that includes a microprocessor 102 that provides motor control signals via line 110 to an application specific integrated circuit (ASIC) 112 that controls a plurality of gate drivers 130. The ASIC 112 provides information to the microprocessor 102 via line 111, and provides drive signals via line 131 to switch a plurality of power switches 124 that are used to control an electronically commutated motor (ECM) 114 (col. 4, lines 21-52). The motor 114 may include means for

sensing the position of its rotatable assembly such as a position sensing circuit 126 for sensing back electromotive force (back EMF) and which provides a zero crossing detector signal via line 127 to which the ASIC is responsive. A back EMF sensing circuit 126A, shown in Fig. 4, includes a sensing network and comparators (col. 4, line 65 to col. 5, line 3).

Fig. 4 of Archer is a schematic diagram of portions of the block diagram of Fig. 1 (col. 9, lines 66-67). The ASIC 112 activates power switches 406-411 in pairs, wherein one switch is closed for each winding of the motor 114 to be energized. The power switches are driven by drivers in response to drive signals supplied by the ASIC 112 (col. 10, lines 4-13). The ASIC 112 provides voltage signals shifted from 5 volts to 10 volts for driving the power switches 406-411, and gate drives 416-421 condition the signals from the ASIC for optimal operation of the switches 406-411 by adjusting their switching speed (col. 10, lines 36-43). Motor phase currents are sensed when power is being exchanged from the supply 402 to the motor 114 and vice-versa. Current in the windings of the motor 114 is compared to a reference current signal (IREF) provided by the ASIC 112, and the comparison results in a signal being input to the ASIC 112 to execute current regulation. The gate drives energize two of the power switches at the beginning of a PWM cycle, which allows the current in the windings of the motor 114 to increase until reaching a threshold value set by the reference current (IREF). At this instant, one or both of the power switches are turned Off causing the motor phase current to decay. The switches remain Off until the beginning of the following PWM cycle, thus completing one regulation cycle. In particular, ASIC 112 defines reference current IREF which is converted from a digital signal to an analog signal by a D/A converter 435. A comparator 432 compares the motor phase current with the analog of the reference current, and the output of the comparator is logic level low when the when the motor current exceeds IREF. The ASIC 112 controls the torque of the motor 114 by causing switches to be turned Off in response to the difference between the detected motor phase current and the reference current (col. 10, line 54 to col. 11, line 12).

In contrast, independent claim 4 recites a circuit arrangement in a variable speed electric motor controller that includes a closed loop feedback circuit for generating a signal indicating the voltage across the electric motor, the signal being input to a state machine for monitoring thereof. Independent claim 15 similarly recites a closed loop feedback loop means for monitoring voltage across a motor and generating a signal for input to a microprocessor. The applicant respectfully asserts that Archer does not teach or suggest such a closed loop feedback circuit, but rather teaches means, such as a shunt resistor, to monitor motor phase *currents* (see col. 10, lines 44-53). Furthermore, present claim 15 recites a

digital to analog converter means for converting a digital signal to an analog voltage for setting a voltage across the electric motor. Such a digital to analog converter means is absent in Archer. Thus, since Archer does not include or even suggest a closed loop feedback means for generating a signal indicating the voltage across the electric motor, or a digital to analog converter means for converting a digital signal to an analog voltage for setting a voltage across the electric motor, claims 4 and 15 cannot be anticipated. Archer fails to disclose each and every recited feature of claim 4 or 15. Moreover, claims 5-7, 9 and 16-17 all depend either directly or indirectly on claims 4 or 15, and thus these claims are also not anticipated by Archer for at least the same reasons.

In view of the above remarks, the applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. § 102(b) rejection of claims 4-7, 9 and 15-17.

Claim Rejections under 35 U.S.C. § 103(a)

Claim 1 was rejected for allegedly being obvious over Archer. Claim 1 relates to an electric motor linear speed controller that includes:

> a digital to analog converter means for converting an 8-bit digital signal to an analog voltage **for setting voltage across a motor**;
>
> a digital state machine means for converting the duty cycle of an input signal for output to the digital to analog converter means; and
>
> a closed loop feedback loop means for monitoring **and setting the voltage across the motor**. (Emphasis added)

As explained above, Archer contains circuitry to monitor the motor phase *currents*, and if the current in the windings is greater than a reference current (IREF), operates to switch Off pairs of power switches to control the torque of the motor. Such circuitry and operation is substantially different than that recited in claim 1 of the present invention. In particular, Archer does not suggest or teach a digital to analog converter means or a closed loop feedback loop means operable to set a voltage across a motor as recited in claim 1. Thus, claim 1 is patentably distinct thereover. Moreover, those of ordinary skill in the art would not have been motivated, absent a hindsight review, to modify Archer in such a manner that voltage rather than current was being measured.

Claims 2-3, 10-11, and 13-14 were rejected for allegedly being obvious over Archer as applied to claim 1 in view of Makaran, U.S. Patent No. 5,744,921 ("Makaran").

Makaran pertains to a control system and to a drive circuit for a five phase brushless DC motor. In particular, the disclosed drive circuit includes a plurality of position sensors that generate a plurality of signals indicating the rotary position of the rotor, electrically controllable switches coupled to the windings, and a motor controller coupled to the position sensors and the switches. The motor controller is configured to generate commutation control signals based on the pattern of signals received from the position sensors and to apply control signals to the controllable switches, wherein the controllable switches control the flow of current through the windings in response to the control signals (see col. 2, lines 52-67 of Makaran). Makaran does not provide any teaching to overcome the deficiencies of Archer. In particular, Makaran does not suggest or teach a digital to analog converter means or a closed loop feedback loop means operable to set a voltage across a motor, as required by claim 1. Therefore claim 1 is patentably distinct thereover. Since claims 2-3, 10-11, and 13-14 all directly or indirectly depend on claim 1, these claims should be allowable for at least the same reasons.

Moreover, there was no motivation for those of ordinary skill in the art to combine Makaran and Archer. Even if, for the sake of argument, such a motivation to combine did exist, there would have been no reasonable expectation of success in achieving the present invention. This is because even the combination of Makaran and Archer still fails to disclose or even suggest the presently recited feature of a digital to analog converter means or a closed loop feedback loop means operable to set a voltage across a motor. For any of the above reasons, the rejection of Archer or Makaran and Archer under 35 U.S.C. § 103(a) has been overcome and should be reconsidered and withdrawn, since no *prima facie* case of obviousness has been stated on the record.

Dependent claim 8 was rejected for allegedly being obvious over Archer as applied to claim 4. Claim 4, however, is patentably distinct from Archer, as explained above, and thus claim 8 should be allowable for at least the same reasons.

Dependent claim 12 was rejected for allegedly being unpatentable over Archer and Makaran as applied to claim 10, and further in view of Hipkins et al., U.S. Patent No. 4,208,621 ("Hipkins"). Hipkins pertains to a motor control system for controlling the operation of a multiple horsepower brushless motor (see Abstract). Hipkins does not suggest or teach a digital to analog converter means or a closed loop feedback loop means operable to set a voltage across a motor. Thus, claim 12, which indirectly depends upon claim 1, is patentably distinct from these cited references for at least the same reasons as claim 1 explained above.

Claim 18 was rejected for allegedly being obvious over Archer in view of Makaran. Claim 18 pertains to a linear speed control for an automotive electric motor, and includes:

> a digital to analog converter, for converting an 8-bit digital signal to analog voltage **for setting voltage across said electric motor**; and
>
> a closed loop feedback loop, **for monitoring the voltage across said motor** and generating a signal for input to said digital state machine. (Emphasis added)

As explained above, Archer contains circuitry to monitor the motor phase currents, and if the current in the windings is greater than a reference current (IREF), operates to switch Off pairs of power switches to control the torque of the motor. Such circuitry and operation is substantially different than that recited in claim 18, as set forth above. In particular, Archer does not suggest or teach a digital to analog converter operable for setting voltage across the electric motor, or a closed loop feedback loop for monitoring the voltage across the motor as recited in claim 18. Makaran also fails to suggest or teach such elements, as previously discussed. Thus, claim 18 is patentably distinct from Archer or Makaran, either taken alone or in combination.

In view of the above amendments and remarks, the applicant respectfully requests reconsideration and withdrawal of all of the 35 U.S.C. § 103(a) rejections of claims 1-3, 8, 10-14 and 18, because no *prima facie* case of obviousness has been stated on the record.

CONCLUSION

In view of the remarks made herein, the applicant respectfully submits that the entire application is in condition for allowance, early notice of which would be appreciated. Should the Examiner not agree that all pending claims are allowable, then a personal or telephonic interview is respectfully requested to discuss any remaining issues and expedite the eventual allowance of these claims.

Respectfully submitted,

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Enclosure